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REPORT ON WATER POLLUTION, SOUTHEAST DRAINAGE BASINS. PART I

PUBLIC HEALTH SERVICE
WASHINGTON, D. C.

1950

PB 260 298

REPORT ON WATER POLLUTION
SOUTHEAST DRAINAGE BASINS

1950

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16. Abstracts

The current status of the National Water Pollution Control Program for the Southeast Drainage Basins is reported. The study provides an overview of water pollution control for the area giving available data on water use, condition of the waters, adequacy of existing treatment facilities, and the need for improved, enlarged, or new treatment works. The area includes part or all of Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Tennessee, and West Virginia.

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ERRATA

Part 1

Page	
1	Line 15 "which" misspelled
3	Line 6 "Agencies"
5	Line 9 "South Carolina"
7	Line 8 change 120 to 207
12	Line 4 "have" should be "has"
17	Paragraph 2, line 2, capitalize "State Water Pollution Control Agencies
	Paragraph 3, Line 1, capitalize "State"
18	Last paragraph, next to last line, "equipping" misspelled. Last line, capitalize "State Water Pollution Control Agencies."
19	Paragraph 1, line 3, capitalize "States"
	Paragraph 1, line 4, capitalize "States"
20	" 3, " 2, ST. Johns misspelled.
21	Paragraph 2, line 3,"Tampa Bay"
24	Paragraph 2, line 5, add after Hesseltine, "in his The South in American History."
27	Paragraph 3, line 3, change "dependence of" to "dependence on"
	Paragraph 4, line 4, "misuse"
28	Line 3, change "275,000 sq. miles" to "282,652 square miles."
31	Line 12 delete "although not needed for irrigation"
34	Paragraph 1, line 8, change"adopted"to"adapted."
35	Last line, period between "area" and"apples."

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41	Paragraph 2, line 1, "area" misspelled.
47	Paragraph 2, last line, "A_1 to A_{46} and B_1 to B_{46}"
48	Paragraph 3, line 5, capitalize "State."
	Paragraph 3, line 8, capitalize "State."
	Paragraph 4, line 2, change "arid" to "acid."
52	Paragraph 2, line 11, change "cities" to "sites."
55	Paragraph 3, line 5, eliminate "Norfolk", change to read "Hampton Roads area of" eliminate "region."
56	Paragraph 3, line 8, "develop" is misspelled.
57	Paragraph 1, end with period.
60	Paragraph 1, line 3, capitalize "States."
	Paragraph 2, lines 5 and 6, capitalize "States."
	Paragraph 3, lines 2 and 4, capitalize "States."
	Paragraph 4, linel, capitalize "States."
	Paragraph 5, line 1, capitalize "States."
61	Paragraph 1, line 2, capitalize "States."

REPORT ON WATER POLLUTION

Southeast Drainage Basins

1950

PRELIMINARY DRAFT OF PROPOSED REPORT

NOT FOR PUBLIC RELEASE

Prepared by:

Southeast Drainage Basins Office
Division of Water Pollution Control
Public Health Service, Federal Security Agency

On the basis of information supplied
by the following Agencies:

Alabama Water Improvement Advisory Commission
Florida State Board of Health
Georgia Department of Public Health
Louisiana Stream Control Commission
Mississippi State Board of Health
North Carolina State Board of Health
South Carolina Water Pollution Control Authority
Tennessee Stream Pollution Control Board
Virginia Water Control Board

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Each sub-basin report includes the following:

Table A - Sources of Pollution - Municipal

Table B - Sources of Pollution - Industrial

Table C - Existing Treatment Facilities - Municipal

Table D - Existing Treatment Facilities - Industrial

Table E - Adequacy of Existing Treatment Facilities

Table F - Progress in Pollution Abatement

Table G - Requirements for Municipal and Industrial Waste Treatment Plants

Table H - Status of Treatment Works Projects to Abate Pollution

Table I - Project List - Municipalities and Industries Requiring Improvements for Abatement of Pollution

AUTHORITY

Authority for preparation of this report is contained in Section 2(a) of the Water Pollution Control Act, Public Law 845, 80th Congress, approved June 30, 1948.

"The Surgeon General shall, after careful investigation, and in cooperation with other Federal agencies, with State water pollution agencies and interstate agencies, and with the municipalities and industries involved, prepare or adopt comprehensive programs for eliminating or reducing the pollution of interstate waters and tributaries thereof and improving the sanitary condition of surface and underground waters. In the development of such comprehensive programs due regard shall be given to the improvements whcih are necessary to conserve such waters for public water supplies, propagation of fish and aquatic life, recreational purposes, and agricultural, industrial, and other legitimate uses. For the purpose of this subsection the Surgeon General is authorized to make joint investigations with any such agencies of the condition of any waters in any State or States, and of the discharges of any sewage, industrial wastes, or substance which may deleteriously affect such waters."

ACKNOWLEDGMENTS

The Public Health Service wishes to express particular appreciation to the following State Water Pollution Control Agencies for supplying information upon which this report is based: Alabama Water Improvement Advisory Commission, Florida State Board of Health, Georgia Department of Public Health, Louisiana Stream Control Commission, Mississippi State Board of Health, North Carolina State Board of Health, South Carolina Water Pollution Control Authority, Tennessee Stream Pollution Control Board.

The cooperation of these State Authorities in checking the tabular summaries of their respective States, reviewing the preliminary draft of the report for its errors, and the submitting of helpful comments is acknowledged with appreciation.

Other State Agencies from which assistance was obtained include State Board of Health, Louisiana, Fish and Game Department of various States, State Planning Board of Virginia and Alabama, Georgia State Department of Mines, Mining and Geology, State Chamber of Commerce in both Georgia and Alabama.

Acknowledgment is made also for assistance received from the following Federal Agencies: the Corps of Engineers, Department of Army; U.S. Geological

Survey, Fish and Wildlife Service, National Parks Service of the Department of Interior; Bureau of Census, Department of Commerce; Soil Conservation, Department of Agriculture; Federal Power Commission; and the Community Facilities Service of the General Services Administration.

Many other agencies, Federal and State, as well as individuals were most helpful in supplying information and their cooperation is likewise acknowledged. Much of the descriptive data used were obtained from reports and publications too numerous to list here separately, which have been released by State and Federal agencies. Acknowledgment is made for the use of all such published data.

SUMMARY

This report is an analysis and interpretation of the data supplied by State Water Pollution Control Agencies concerned. It provides the current status of the National Water Pollution Control Program for the Southeast Drainage Basins, pending completion of comprehensive programs for each of the river systems. It's purpose is to provide an overall view of water pollution control for the area giving available information on: water use, the condition of the waters, an estimate of the adequacy of existing treatment facilities, and the need for improved, enlarged or new treatment works.

The Southeast Drainage Basins include all the river systems discharging into the Atlantic Ocean or the Gulf of Mexico starting with the Rappahannock River in Virginia to and including the Pearl River in Mississippi. The total area of the drainage basins is 282,652 square miles, about one-tenth the area of continental United States. The area includes part or all of the States of: Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Tennessee and West Virginia. The basin is divided into forty-six sub-basins as established by the Water Pollution Control Agencies of these

States.

Twenty-one sub-basins are interstate. Their streams flow from one State to another or form State boundaries. In these basins, pollution originating in one state may affect the water use in another state or other states. There are three interstate sub-basins common to the States of Virginia and North Carolina, three common to the States of North Carolina and South Carolina and the Savannah River forms the boundary between South CArolina and Georgia.

Georgia also has five sub-basins in common with Florida and three in common with Alabama. Alabama has four sub-basins in common with Florida and three others in common with Mississippi.

The Pearl River,which flows through Mississippi, also drains a part of Louisiana and forms a part of the eastern boundary of that State.

The estimated 1950 population for the basins is 17,908,000 people, an increase of about 16 percent over the 1940 population figure. The increase has been greater in urban areas, 34 percent compared with a 6 percent increase in the rural population. There has been a 20 percent increase in urban communities (over 2,500 people) since 1940 and there are now 461 urban communities, 56 with populations of over 25,000

and 11 over 100,000.

Water uses in the basins include industrial and domestic water supplies, power development, navigation, fish and wildlife propagation, recreational purposes, final waste disposal and a limited amount of irrigation. In some areas ground water is available for moderately large demands. There is adequate surface water in all parts of the basin to support considerable development.

There are 1,559 public water supplies. Three hundred and forty-eight surface water supplies, 1194 ground water supplies and 17 supplies using both surface and ground water.

These water supplies serve an estimated 8,410,000 people of which approximately 5,000,000 depend entirely or partly on surface water as a source of supply.

There are 1,175 municipalities with sewerage systems serving more than 6,500,000 people. The actual amount of pollution discharged to the watercourse from these sewerage systems is not known. It is estimated that 715 sewerage systems serving about three and one half million people discharge wastes (including some industrial waste) with a population equivalent of about three and a quarter million people.

In addition to the industrial wastes discharged to domestic sewerage systems, 367 industrial plants discharge organic wastes. Data as to the strength of these wastes are available for only 160 of these sources which are reported discharging to the watercourses wastes with a population equivalent of 3,535,814 people. The volume and strength of the wastes from the other 120 plants producing organic waste, 62 plants producing inorganic wastes and 696 plants producing wastes of undetermined type, are not known. There is an urgent need for this data.

Stream pollution is a serious problem in some of the basins, especially in the more highly industrialized areas. Water supplies, and other water uses have been and are affected. New treatment works are needed and some of the existing treatment facilities need enlargements, additions, and/or better operation.

Seven hundred and seventy-nine municipalities have 630 primary treatment plants and 271 secondary treatment plants serving an estimated total of 3,300,000 people. The sewage from an estimated 3,200,000 people is discharged without treatment. Only 59 of the 1,109 industrial plants are reported as having waste treatment facilities. Two hundred and sixty-six plants are reported as having no waste treatment facilities

and the status of treatment facilities for the other 784 plants is undetermined.

Of the 901 municipal sewage treatment plants only 350 are reported as adequately designed for their present loading. The capacities of 196 of the plants are not reported.

The operation of the plants is reported as: satisfactory for 530 plants, unsatisfactory for 149 plants, and undetermined for the other 222.

The status of the 59 existing industrial waste treatment plants is about the same. The capacities of 23 are reported as satisfactory, 13 unsatisfactory and the remaining 23 undetermined. The operation of these plants is reported, satisfactory for 29, unsatisfactory for 5 and undetermined for 25.

Progress in pollution abatement was very slow in the immediate post-war period. There has been some improvement. Fifty-three plants were completed in 1949 by municipalities with a total design population capacity of 371,875. Progress in industrial waste treatment plant construction has not been as good.

The requirements for municipal and industrial waste treatment plants are not all determined. Additional data are required to determine the status of

261 municipal, and 926 industrial sources of pollution.

The Georgia Water Pollution Control Agency has not supplied information regarding: 1. the adequacy of existing treatment facilities with relation to capacity or operation, 2. the requirements for municipal and/or industrial waste treatment plants, nor 3. the sources of industrial pollution. This accounts to a large extent for the large number of industrial plants reported in Table B as producing wastes of undetermined type, 96 percent of these are from "Manufacturers of Georgia" (see footnote Table "B"). It also accounts for 75 percent of the municipal plants listed in Table E under "Capacity Undetermined", 84 percent of the undetermined municipal requirements, and 72 percent of the undetermined industrial requirements in Table "G". No information was received from the Louisiana Water Pollution Agency in regard to industrial pollution in the Pearl River sub-basin.

New sewage treatment facilities are needed by 483 municipalities. These facilities would serve approximately three million people. The existing plants of another 175 municipalities serving approximately one million people need replacement, enlargements

or additions. New waste treatment plants are needed by 135 industrial establishments and nine existing plants need enlargements or additions. Seventy-eight municipalities have plans for treatment works under preparation. Thirty-six others have their plans approved and the construction of ten of these plants is awaiting financing. Twenty-five new plants are under construction. Eleven other municipalities have been ordered to abate the pollution caused by their sewage. No formal action has been taken in regards to 455 other needed projects and the status of 314 projects is undetermined.

One industry is preparing plans for a waste treatment plant. Two others are constructing industrial wastes treatment works. No formal action has been taken in regards to 232 industrial waste outlets and the status of project requirements is undetermined for 835 other industrial plants.

Three of the States in the basins have effective water pollution control legislation. One State has the authority to and has adopted rules and regulations necessary for an effective program. Another State is proposing additional water pollution control legislation. Effective uniform State legislation is necessary to promote pollution abatement. A program of education

is also needed to present the advantages and necessity of pollution abatement.

On the basis of available data, which are incomplete, the approximate capital cost of municipal treatment facilities for pollution abatement in the basins is estimated at $108,000,000. This does not include requirements for municipal waste treatment plants listed as undetermined or any industrial waste treatment works. Considering these other needed facilities, the approximate capital cost is estimated at $500,000,000.

CONCLUSIONS

The Southeast Drainage Basins Office has compiled data submitted by the State Water Pollution Control Agencies and from this and other available information have derived the following conclusions:

1. The area is rich in natural resources; fertile lands, large forests, wildlife, mineral wealth, and an abundance of water. The waters have various extensive legitimate uses for; public and industrial water supplies, agriculture, recreation, wildlife, power, navigation, sport and commercial fishing.

2. The waters of the basin are not currently used to their utmost; there is an adequate quantity of water to sustain extensive additional industrial expansion, population growth and other authentic uses provided all uses are considered in the development of comprehensive water pollution control programs for each of the sub-basins.

3. Projects for the development of hydroelectric power and other purposes now under construction or authorized for construction will cause extensive industrial development and a large increase in population.

4. Pollution problems have developed with the

growth in population of urban areas and increase of industrial activity. Losses and injuries now experienced will increase if planning and pollution control does not keep in advance of future urban and industrial development. Only basin wide comprehensive water pollution control programs can preclude economic losses and injuries to watercourses and guarantee more complete utilization of the water resources.

5. Planned pollution control is more effective and more economical than the abatement of existing pollution. It is therefore essential that all interested State and Federal agencies exchange information and coordinate their efforts to prevent pollution problems that would arise directly as a result of water resources development projects.

6. The rivers in the more highly industrialized and/or populated areas of the basin are polluted to a degree that existing water supplies are endangered and the development of additional needed water supplies is handicapped or prevented. These polluted waters can not be used for certain other legitimate purposes.

7. In many sub-basins past and present mismanagement of land, favoring soil erosion, has resulted in excessive silt in watercourses. This

pollution not only has resulted in a loss of a valuable natural top soil resource, but has impaired ability of streams to recover from organic pollution, destroyed aquatic life, hindered navigation and in some instances increased cost of water treatment and has prevented most recreation uses.

8. Although twenty-one of the forty-six drainage basins in the area are of an interstate character, no "Interstate Compacts" for pollution abatement and/or control exist between the States.

9. Diverse State legislation for control of water pollution exists in the area. Four of the seven States have specific legislation that enables them to develop comprehensive water pollution control programs on a basin wide basis. Others need greater authority to restore and protect the watercourses. Uniform State legislation and interstate cooperation is needed to assure the development of basin wide comprehensive programs.

10. The public has become interested in water pollution control but there remains a need for a broad information and education program to apprise the public and industry of the objectives of the State Water Pollution Control Agencies and the benefits of, the necessity for, planned basin wide water pollution control programs.

11. Pollution data is incomplete in most sub-basins. Data on industrial wastes are fragmentary and additional field information is required. There are, however, sufficient data in a few sub-basins for initial action toward abatement. Existing pollution can be reduced by construction of presently planned treatment works.

12. Additional investigations of most of the streams and sources of pollution are necessary to provide complete data on existing pollution. Additional stream studies are needed regarding; self purification, extent of damage during critical flow periods and degree of waste treatment required. These data are essential for a comprehensive program of pollution abatement and the establishment of water quality standards for maximum utilization of the water resource.

13. The financing of construction of municipal sewage treatment facilities is frequently a major obstacle in the construction of these needed works.

14. Insufficient personnel, equipment, and/or funds are retarding the development of sound water pollution control programs in some of the States. Salary restriction in some States are preventing the

employment of additional qualified professional personnel.

The Georgia Water Pollution Control Agency has not made available all the data needed for this report, therefore, some of the conclusions may not be applicable to conditions in that State.

RECOMMENDATIONS

Accurate planning is the most economical approach to any problem. Sound planning must be based on fact. Comprehensive water pollution control programs considering all water uses are essential to assure the fullest economical use of the water resource without damage or injustice to any water users. To speed the development of comprehensive programs for each of the sub-basins the following recommendations are made.

1. Comprehensive investigations should be made by state water pollution control agencies to fill the present gaps in information on pollution sources and stream conditions. A particular effort should be made to determine the industrial waste situation.

2. Present informal agreements between states with regard to water pollution control of interstate streams should be strengthened and uniform policies of investigation, abatement and prevention of interstate pollution should be developed for all of the 21 interstate sub-basins.

3. Where the need is apparent, each State should enact workable water pollution control legislation to facilitate the development of comprehensive programs for inter and intra state streams.

4. Public information programs, apprising the people of the basins of the importance of comprehensive water pollution control, should be expanded and strengthened, so as to increase public support for conservation of the water resources.

5. Municipalities, institutions and industrial plants should recognize their responsibilities by planning and constructing the needed pollution abatement projects. Where ample notice has been given and evasion of responsibility is apparent the regulatory agencies should vigorously apply their enforcement powers.

6. Research programs should be developed cooperatively by industrial and governmental agencies to develop or improve waste treatment methods and determine the possibility of reclamation of the wastes.

7. Funds for the maintenance and operation of all existing and future waste treatment facilities should be provided as well as means to facilitate the financing of municipal waste treatment works where adequate provisions do not exist.

8. Adequate appropriations for completely staffing and equiping the state water pollution control agencies and for the operating expenses

incurred in carrying out the planning, educational, enforcement and operational functions of their abatement programs should be provided by the states. In states where regulations limiting salaries prevent employment of additional qualified technical personnel action should be taken to remove these obstacles.

9. All Federal, State, and local agencies or groups should cooperate in the development of comprehensive water pollution control programs so that all views and interests will be considered. There should be a pooling of information from all of the Federal, State, and local groups to determine where gaps in the data exist. All interested agencies should be kept advised of the status of all programs and projects so the data will reflect current conditions.

GENERAL DESCRIPTION

Historical Background

The Southeast Drainage Basins area includes all of the river systems discharging to the Atlantic Ocean or the Gulf of Mexico from the Rappahannock River in Virginia to the Pearl River in Mississippi. It was this area that the Spaniards sought to conquer and convert, following the discovery of America in 1492. The Spaniards, who had been fighting holy wars against the Mohammedan infidels for centuries, were a race of fanatical warriors who recognized only two respectable occupations, evangelism," the Cross" and soldiering, "the Sword."

Part of the region remained a Spanish Empire for one hundred and fifty years before the Spanish claim was seriously challenged. The Florida Peninsula was under Spanish influence for three hundred years. They did not expand northward as the conquest and plundering of Mexico and South America kept them occupied.

First to arrive was Ponce de Leon, landing near the mouth of the St. Johns River in 1513. In 1521 he returned to continue his search for the "Fountain of Youth" but lost his life before completing his explorations in Florida. In 1519 Alvarez de Pineda discovered Mobile Bay populated with forty Indian Villages. Vasquez de Ayllon landed on the Atlantic coast in 1521 and then returned to Spain taking some Indians for slaves. He returned

in 1526 with six hundred followers and attempted to settle on the coast of either Carolina or Georgia. One of the Indians who returned with him escaped and probably was instrumental in turning the natives against the Spanish and the survivors of the colony were driven out.

The next attempt at exploration was in 1528 when Panfilo de Narvaez set out to explore a tract of land granted to him by Charles I of Spain. He marched from Tampico Bay up the west coast of Florida northward to the present site of Pensacola where his supply ships failed to meet him. He finally sailed away defeated by the swamps and hostile Indians.

Eleven years later (1539) Hernando de Soto became Governor of Florida. He began an expedition at Tampa Bay in search of gold which took him northward across the flat country into Georgia and Alabama and eventually led to the discovery of the Mississippi River.

French interest in the province of Florida, although short-lived, was not lacking. A group of French Huguenots in 1562 led by Jean Ribaut, seeking a haven from religious persecution, landed at the mouth of the St. Johns River and built Fort Carolina. Spanish resentment to this intrusion led three years later to an attack which resulted in the capture of the fort and the death of nearly all of the residents. In the same year (1565) Pedro Menendez de Aviles founded St. Augustine which became the first permanent European settlement in the United

States.

Spanish explorations extended up the coast of what is now Georgia and South Carolina where a number of temporary forts or settlements were established. These attempts and the settlement of Pensacola in 1698 represent the only colonizations by Spain in this region.

The first interests of the English in the present area of the Southeast Drainage Basins were toward exploitation in the manner of the Spanish adventurers. Their attention, however, was soon diverted toward the establishment of trading posts and then toward colonization.

The first attempt to establish an English outpost in this area was made by Sir Walter Raleigh on Roanoke Island off the coast of North Carolina in 1584. This effort was a failure and the fate of the colonists remains a mystery to this day. It was not until 1607, at Jamestown, Virginia, that the first permanent English settlement in America was founded.

The settlement of the Carolinas was begun when King Charles II of England in 1663 granted what is now North and South Carolina to a group of eight "lord proprietors". Charleston, destined to become the economic, cultural, and social center of a vast section of colonial America, was founded in 1680.

Georgia, the last of the English colonies to be established in America, was formed as a buffer colony between the Spaniards in Florida and the other colonies. Its founder,

General James Oglethorpe, also had philanthropic motives and peopled the colony with inmates of the British debtor prisons on condition that they help defend the colony against the Spaniards and the Indians. Savannah, the first planned city in America, was laid out by Oglethorpe in 1733.

The early history of Alabama and Mississippi is intimately tied up with the Spanish, French, and Indians. The area was, at the time of discovery by white men, occupied by large and powerful Indian tribes. These were the Apalachi on the northwest coast of Florida; the Creeks (a confederation of tribes) of the Chattahoochee, Flint, Alabama, Tallapoosa, and Coosa Rivers; the Chickasaw of northern Mississippi, and the Choctaw of southern Mississippi and southwest Alabama.

In 1702 the French built Fort Louis de la Mobile on the Mobile River and the Governor of French Louisiana moved the capital of the territory there. Nine years later the fort was moved to the present site of Mobile; and its name was changed to Forte Conde' la Mobile in 1720.

French traders were the first white men to make regular contact with the Indians of this region. The French in 1714 built Fort Toulouse at the confluence of the Coosa and Tallapoosa Rivers in Alabama. The numerous rivers along the Atlantic and Gulf Coasts, most of which were navigable by small boats to the "fall line", played an important part in opening up the new country to settlement, serving as highways by which produce could

be gotten to market.

The treaty of Paris in 1763 following the French and Indian War resulted in the territory of Alabama and Mississippi being ceded by France to England. At the same time Spain, which had also been at war with England, lost East Florida thus bringing to an end years of quarreling with the English colonists. Spain, however, gained Mobile and West Florida from the French; and later during the American Revolution, regained East Florida from the English.

The Revolutionary War brought a period of increased hardship to the southern colonies. These colonies played an active part in the prosecution of the war. Many leaders were produced from these colonies among whom were George Washington and Thomas Jefferson. Hesseltine writes concerning the war, "Late in the year 1778, the British changed the area of the war from the North to the South. Fortunes of war had given the Americans victory in campaigns in New England and the middle states, but the British expected aid from the back-country loyalists of the South. The plan of campaign contemplated a beginning in Georgia and a northward advance which would roll up the South." Georgia and South Carolina were occupied as planned. Important battles were fought at Camden and Cowpens in South Carolina, and at King's Mountain and Guilford Court House in North Carolina. The defeat of Cornwallis by Washington at Yorktown, Virginia, on October 19, 1871, gave final assurance

of independence for the American colonies.

The French traders west of Georgia influenced the Indians to be friendly to the Americans during the Revolution; but the English, aided by unjust actions of selfish men and the encroachments of the whites, turned them against the new nation following the war.

With the demand for cotton increasing, the lands between Georgia and the Mississippi River became especially attractive to the prospective cotton growers; but Spain, the United States, Georgia, and South Carolina possessed conflicting claims upon the territory, and large-scale migration had to wait until these claims could be settled.

In 1802 Georgia ceded her interest in the territory to the United States. Soon thereafter the Federal Government extended its land system to the region, opened land offices, cleared the Indian titles in a series of treaties, and set up the territory of Mississippi. The settlers, however, were dependent upon the rivers for transportation and access to their lands. Spain controlling the mouths of the rivers had closed them to American commerce. Vagueness in the terms of the Louisiana Purchase enabled Congress in 1810, following a revolution in the disputed territory, to simply declare it (West Florida) part of the United States and in 1813 Mobile was seized by Spain.

During the War of 1812 the Creek Indians incited by Tecumseh rose against the whites in the territory, but Andrew

Jackson disasterously defeated them at Horse Shoe Bend on the Tallapoosa in 1814. Further Indian cessions and a greatly increased migration followed the war. Consequently the territory was divided, Mississippi becoming a state in 1817 and Alabama in 1819.

Following the War of 1812, East Florida (Florida as it is today) became the goal of Southern expansionists. The Spanish had never given up intriguing with the Indians, who now and again raided settlements in Georgia and Alabama. Jackson in 1818 led a group of frontier militia against the Seminole Indians, pursued them into Florida and captured two Spanish forts. This resulted in an agreement with Spain to sell Florida to the United States. It thus became a U.S. territory in 1821 and in 1845, a State. Bitter warfare between 1835-42 was necessary to pacify the Seminoles.

The political and economic events leading up to the War Between the States were culminated by the secession of South Carolina from the Union on December 20, 1860 followed closely by the other Southern States. Warfare was begun by the capture of Fort Sumter in Charleston Harbor by Confederate forces on April 13, 1861.

The capital of the Confederacy was established at Montgomery, Alabama, but was transferred to Richmond, Virginia soon thereafter. The Capture of Richmond, therefore, became the prime objective of the Union which resulted in much of the

fighting occurring in that State. Other States, however, notably Georgia, also saw heavy fighting and suffered greatly.

The War Between the States left the South ravaged and destitute. The Reconstruction days which followed brought about a tremendous social upheaval out of which has grown a "New South".

There was a limited amount of industrial development in the South before the War Between the States, but the backbone of the economy was cotton. Farming methods and the dependence of one crop retarded the development of the area. The last thirty or forty years, however, have brought about a marked change. The South has developed into a combined agricultural and industrial economy, and its agriculture is no longer limited to cotton.

The future is bright. The natural resources of the area, especially the abundance of good quality water, assures industrial development providing the streams, most of which are not now grossly polluted, are protected against mis-use.

Physical Description

The Southeast Drainage Basins of Continental U.S. lies roughly between the 75th and 90th meridians west, and between the 25th and 39th parallels north. The area with an average width of approximately 250 miles extends band-like along the Gulf and Atlantic Coasts for a distance of roughly 950 miles. The peninsula of Florida projects southward from the middle of this band for about 400 miles. The major part or all of the

States of Virginia, North and South Carolina, Georgia, Florida, Alabama, and Mississippi are included in the area. The basin encompasses approximately 275,000 square miles, or nearly one-tenth of the area of continental United States. Natural boundaries are formed by the Atlantic Ocean on the east, the Gulf of Mexico on the south, the Mississippi River drainage on the west, the Tennessee River drainage and the Appalachian mountain range on the northwest, and the Potomac River drainage on the north.

The topography of the continental portion of the Southeast Drainage Basins is not uniform, but differs widely in the different parts of the area. The basin lies in two of the major physiographic divisions of the United States, the Coastal Plain on the southeast and east and the Appalachian region on the northwest.

The Coastal Plain is a single great province which borders the coast from southern New England into Mexico. It is generally characterized by flatness and rather light sandy soils. The Florida Peninsula section of the Coastal Plain is due to the partial emergence of an extensive flat-topped plateau which rises abruptly from the deep sea floor. This latter area is distinguished by many lime stone sinks and shallow lakes. Streams of the Coastal Plain are sluggish, and are generally bordered with extensive well-timbered swampy areas which serve as natural reservoirs to retain the flood pools.

The Appalachian region, on the other hand, includes

parts of four provinces. All of which extend far beyond the boundaries of the area. These provinces are the Piedmont upland, the Appalachian Mountains, the Appalachian Valley and Ranges and the Appalachian Plateau.

The Piedmont upland extends from Hudson River to central Alabama. It reaches an extreme altitude of 1800 feet in the Southeast Drainage Basins.

Piedmont streams are characterized by occasional rapids with long intervening pools and favorable sites for storage dams. Underground waters are not abundant, springs are usually relatively weak, and dry-season flow of small tributaries is relatively low. Much of the land shows the effects of serious erosion under the plow, although the slopes are moderate. The Piedmont is separated from the Coastal Plain in most areas by a well defined "fall line."

The Appalachian Mountains extend across southwestern Virginia, North and South Carolina and into the northeastern part of Georgia reaching an altitude of about 3,000 to 5,000 feet.

The Appalachian Valley and ranges also extend from New York State to central Alabama, crossing the northwestern part of Georgia.

The Appalachian Plateau, another province that extends from New York State to Alabama includes a portion of the Southeast Drainage Basins in the northern part of Alabama.

The Basins area is characterized by many relatively short streams which are of two general types; i.e. the longer streams arising in the Appalachian Mountains and flowing through the Piedmont upland where they pick up heavy loads of silt; and the shorter, relatively clear streams arising in the Coastal Plain. Many of these rivers are navigable to the fall line which extends from 100 to 200 miles back from the coast.

The Southeast Drainage Basins has a humid or forest type climate with average annual rainfall varying from 35 inches in the Appalachian Mountains of Virginia to 80 inches in the mountains of north Georgia and South Carolina. Average annual rainfall by States varies from 42.63 inches in Virginia to 53 inches in Alabama with an over-all average for the entire area of 49.84 inches. Rainfall is generally heavier along the coast and decreases inland. An exception is found, however, in the mountains at the junction of Georgia, Tennessee, North Carolina and South Carolina where rainfall gradients build up rapidly from 50 inches to 80 inches.

Temperatures within the Basin are somewhat variable, caused by both differences in elevation and the difference in latitude. The mean annual temperature experienced in the northern part of the area is approximately fifty-five degrees, while that in southern Florida is seventy-five degrees.

The growing season varies also with latitude. Throughout most of Florida, and along the Gulf of Mexico the growing

season is more than 260 days. Along the northern margin of the cotton belt and extending into Virginia the growing season is 200 days.

The natural resources of the Basins area are numerous, the greatest in value being its soils and water. Although the soils cannot compare with the richest soils of some other parts of the nation, rainfall and temperature have especially adapted the region to the production of a variety of specific crops of high economic value, including a wealth of forest products.

The region has been blessed with numerous rivers and streams which, although not needed for irrigation, rapidly are being harnessed for the production of hydro-electric power. These streams are playing an increasingly important role in the economic development of the region.

Minerals of chief importance to the region are coal, iron, and phosphate. In addition marble, granite and clays are mined.

Marine life from coastal regions is a rich source of food which benefits the entire nation.

Economic Development

From the beginning of active colonization along the southeast coast the economy of the South has been bound up in the cultivation of staple crops. Hesseltine in his "The South in American History" has written, "From tobacco in Virginia and Maryland, and from rice, in the Carolinas and Georgia, the

plantation system developed; from them stemmed most of the activities of southern life".

It is written in "A Hornbook of Virginia History" published by the Virginia Department of Conservation and Development, "It would hardly be possible to overemphasize the part tobacco played in the Colony's seventeenth century history. Tobacco determined the economy, helped to shape its development, influenced the character of the population, and caused constant friction with Britain. It was the only money crop and was the Colony's money. Transactions were not reckoned in pounds sterling but in pounds of tobacco. It stifled manufacturing, and a law was required to force the colonists to raise enough food for their own needs."

"As long as the crop was steadily profitable it made Virginia a land of small farms and furnished employment for white servants at high wages. When it ceased to be the case, it reduced small farmers and white labor to beggary, turned the Colony into a land of great plantations, put a premium on slave labor."

North Carolina was first settled by an overflow from back country Virginia. Settlers were comparatively isolated from the sea by the scarcity of good harbors and lacked the broad rivers found elsewhere in the southeast. As a consequence it merged into the Virginia back country. Although the farms were mostly small, due to inaccessability to a market, tobacco

was also the money crop here. In addition, however, commerce in naval stores was developed along the coast.

South Carolina, in contrast to its sister colony to the north, became a land of many Negroes with a fully developed plantation system. Hesseltine writes concerning this colony as follows: " Fundamentally, the difference between South Carolina and her northern neighbors was the difference between rice and tobacco". Rice was to the economy there what tobacco was farther north. Larger plantations were possible, profits were great, and labor was cheap. As a consequence many of the planters maintained homes in Charleston, and that city became the social and cultural as well as the commercial center of the region.

Immediately following the Revolutionary War the slave system was definitely on the decline. The area where rice could be grown was limited and the influence of the frontier was tending to produce a land of small farms. The coming of cotton, however, changed the entire nature of the area from South Carolina westward through Louisiana and gave the planter a new lease on life. This was closely associated with the Industrial Revolution, which transformed the textile industry of England, and the invention of the cotton gin by Eli Whitney in Georgia.

Hesseltine describes the situation as follows: "The possibility of producing cotton in the Carolina upcountry freed

the planters from dependence on the rice swamps, and, turning inland, they moved their slaves to newly acquired cotton plantations. At the same time, men of the upcountry abandoned the production of foodstuffs and their small beginnings in manufacturing, and likewise turned to growing the new staple. The advantages of cotton were many. It required less cultivation than did rice and tobacco, was more easily prepared for the market, could be adopted to slave labor or to cultivation by unskilled white hands, and was just as profitable whether raised on one acre or on a thousand. Upcountry farmers found their profits increased by purchasing slaves."

During the first half of the 19th century the economy of the South was one of cotton and tobacco. During the first forty years of the century tobacco production remained relatively constant, but new methods of curing and the introduction of superior varieties about the middle of the century increased production about 115 percent between 1850 and 1860. Cotton production was also increased and bales were taken down the most convenient river to such markets as Charleston, Savannah, and Mobile.

The War Between the States inevitably disrupted the economic and social life of the South. The most important economic institution --slavery, which represented the largest single investment of southern wealth, was destroyed. Only the land and the unbroken spirit of the people remained which enabled

them to begin creating a "New South".

Following the war, the landowners resorted to borrowing in order to raise money to finance their farming through the planting season. This gave rise to "share-cropping", or the tenant farmer system. Under this system the entire structure of southern agriculture underwent modification with a tendency toward a reduction in the average size of farms. Despite these conditions cotton remained the leading crop of the South and the principal export in tonnage of the nation. Rice production was destroyed in South Carolina, but tobacco remained the principal money crop in North Carolina and Virginia.

Following the Reconstruction, the South began a great diversification of agriculture. Most important of these new agricultural interests was truck farming. This development was a natural outgrowth of the increasing industrialization of the nation and the growth of cities. Most important of these early trucking regions was the area around Norfolk and the Eastern Shore of Virginia which developed as early as 1885. Improved rail connections to Chicago and other cities of the Midwest and East, and refrigeration, made possible the shipment of cabbages and potatoes; peanuts and watermellons; strawberries and tomatoes from as far south as lower Alabama and Mississippi, and later from the rich muck lands of Florida.

Closely related to truck gardening was the development of fruit growing, particularly in the Piedmont Area Apples were

produced in the north while peaches and watermellons became the product of the South.

In more recent years livestock production, particularly beef cattle and dairying, has increased in the region. The availability of year-round green pasturage and the growth of nearby cities has been an influencing factor.

The economic development of Florida was slower to start. Its great areas of swamp land and beaches had been inhabited only by a few scattered whites and Seminole Indians. Not until the 1870's was real progress made.

In 1875 it was discovered that oranges could be grown profitably in Florida. Large tracts of swamp land were drained and colonization schemes developed. Today citrus and truck crops provide the greatest part of Florida's agricultural wealth.

In the 1880's the railroad systems were built up, thus a means of getting produce out arrived, and the State was opened up. The vast phosphate deposits east of Tampa which supply three-fourths of the Nation's phosphate so essential to agriculture, were discovered in 1884.

Much of Florida's industry is associated with agriculture. Canneries have developed to handle the vast amounts of citrus fruits and vegetables which are produced in the peninsula.

Beef cattle production is an increasing source of wealth. Large herds of cattle graze on the rich Kissimee prairie north of Lake Okeechobee and on reclaimed areas in the Everglades.

Florida is making a strong bid to become first in beef cattle production in the United States.

Outsiders, fascinated by the climate and beauty of the State built hotels and resorts as the railroads were extended, thus creating the nation's winter playground.

Florida has undergone rapid expansion in population since 1880. In the early 1920's a "land boom" occurred which resulted in a gain in population of over thirty percent in five years. The increase for this decade was nearly a half million, with 429,000 more arriving between 1930-40. In 1930 Florida became more than fifty percent urban, the first of the southern States to become so.

The South, so rich in natural resources, would be expected to develop diverse industries. After the War Between the States industrial development began. New factories appeared in towns and cities; mining and the railroads grew; and cities developed. Atlanta proclaimed itself the "New York of the South" and became the rail center of the region.

The resources of iron, coal and water power have been major factors in attracting heavy industry. The City of Birmingham, incorporated in 1871, is a product of the southern industrial era. Developed near a source of iron ore and coal, it soon became the iron and steel center of the region and is frequently referred to as "the Pittsburg of the South."

The textile industry became particularly prominant, appearing in small and large communities all over the region. By 1920 southern mills were turning out more than half of the total cotton goods in the country, and by 1927, sixty percent of the nations cotton mill workers lived in the South. One of the factors attracting industry was the abundance of unpolluted waters so essential to industrial development.

Other important industries in the region consist of processing of food products, manufacture of paper and allied products, chemicals, rubber products and those associated with petroleum and coal.

Development of hydroelectric power has been an important factor influencing the economic development and industrial growth of the area. Seventy-four existing plants and six plants under construction will have a total generating capacity of 2,440,153 kilowatts, less than one-half the potential power of the area.

The commercial fishery industry of the Atlantic and Gulf Coasts is of economic importance in these coastal areas.

Considerable income in many local areas is derived from winter vacationists, hunters, fishermen and those seeking general recreation .

Along with a growing industrial economy has been a gradual shifting of populations to urban communities. This process is still continuing, but the population is still predominantly rural.

The population of the Southeast Drainage Basins is about 17,900,000, according to the preliminary 1950 U.S.Census reports. Of this total population, about 7,100,000 or forty percent live in communities having urban classification. Urban population increased thirty-four percent during the past decade while the rural population increased only six percent. There are 461 urban communities in the basin, of which fifty-six each have a population of more than 25,000, and eleven each have a population in excess of 100,000.

In regard to future development, it may be expected that industrialization will continue.

The problem of water pollution control is tied closely to the general economic development of the area encompassed by the Southeast Drainage Basins. Soil erosion is one of the major problems. Other types of pollution become acute problems as urban populations increase and industry expands. Demands for water of high quality may be expected to become greater.

USES OF WATER RESOURCES

The water resources of the basin are used for domestic, industrial and livestock water supplies, hydroelectric power, fish and wildlife propagation, commercial fishing, navigation, recreation, limited irrigation and ultimate disposal of wastes. The economic development of the area depends upon but is not limited by the water resources of the basins.

There are 1,559 public water supplies in the basin serving a combined population of approximately 8,410,000, which is about forty-eight percent of the total basin population. Of these supplies 365 (23 percent) obtain all or part of their water from surface sources. The population served by the surface supplies is 4,961,137 or fifty-nine percent of the total population served by public systems. Ground water in the Piedmont Plateau is limited and large water developments must resort to surface waters. Surface waters are abundant in practically all areas of the basin.

The quantity of water used for all industrial purposes is not known. Municiple supplies furnish water to many industries. Numerous industrial establishments obtain large supplies from separate sources. Undoubtedly industrial water demands in the basin far exceed the domestic use.

The use placed on the waters in some areas of the basin by industries and municipalities is great. They not only

depend on the waters for a supply, but use the same waters to dispose of their wastes. The necessity is apparent for maintaining waters of suitable quality for the primary uses of public and industrial water supplies. Waste disposal capacities of the streams must be determined in order to fix municiple and industrial waste treatment requirements and to allocate portions of streams for waste disposal purposes.

Many sub-basins in the are have topography well adapted for development of hydroelectric power. There are seventy-four existing developments having a combined installed generating capacity of 1,891,153 kilowatts. All but one of these are privately owned projects. Six projects under construction will have a total generating capacity of 549,000 kilowatts, of which only one with a planned capacity of 45,000 kilowatts is a private utility development. The total installed generating capacity of existing developments (2,500 kilowatts and over) upon completion of the six presently under construction will be 2,440,153 kilowatts or about one-third of the developed hydroelectric power east of the Mississippi River. The undeveloped hydroelectric project sites in the basin have an estimated potential power of more than 5,700,000 kilowatts.

Many areas in the basin are of importance for recreational purposes. The southern Atlantic Coast, Florida, and the Gulf Coast are the winter playgrounds for a large part of the nation. The waters of these areas, both fresh and salt,

with their excellent beaches, abundant game fish and migratory waterfowl populations, and the warm winter climate are major factors attracting recreation seekers. The coastal areas of Virginia, the Carolinas and Florida similarly serve as a summer playground.

The interior areas also are used extensively for recreation, but primarily by the local inhabitants. The waters there are increasingly being used for bathing, boating, hunting and sport fishing. The importance of the use of these waters for recreation is demonstrated by provision for this activity on multiple purpose reservoirs, and the construction of small impoundments for recreation.

Commercial and game fishing along the coastal areas of the region and in some of the rivers are important uses of the water resources. Oysters, shrimp and crabs, marine shore fishes and the anadromous species such as shad and herring occupy a high position in the economy of the coastal areas. Pollution in many river estuaries has resulted in the closing of large oyster producing areas to fishing, but pollution control activities in some localities has enabled a few areas to be re-opened. Spawning runs of anadromous fishes have been reduced in some Atlantic Coast rivers because of pollution.

Navigation is one of the prime functions of some waterways of the basin, particularly in the lower Chesapeake Bay,

Intracoastal Waterway, the excellent seaports and rivers developed for this purpose. Proposed multiple purpose projects include improvements for navigation in some sub-basins.

A large portion of the overwintering area of our migratory waterfowl is located within the basin. The sounds and bays of the North Carolina and Virginia coasts, the numerous fresh water lakes and marshes of Florida, and the river estuaries of the Gulf Coast provide the necessary food and cover for these species. Other types of wild game dependent, in part or entirely, upon the densely forested swamps along many of the rivers of the Coastal Plain for sanctuary are large populations of white-tailed deer, racoons, opossums, gray squirrels and the remnant of once numerous flocks of turkeys. This game provides excellent hunting in many areas.

With the change from crop farming to livestock production and dairying in large areas of several States in the basin, the use of the surface water resources is of growing importance to agriculture. Also truck farmers in three States of the basin are using irrigation to substantially increase their crop production. The long growing season combined with irrigation of the land has produced a greater yield and further use of water resources for this purpose is anticipated. A satisfactory quality of water for these agricultural uses must be maintained from a public health standpoint.

The water resources of the basin are used for the ultimate disposal of wastes. All are cognizant of the necessity of using the water courses for the final disposal of the liquid portions of domestic and industrial wastes. However, in some of the sub-basins, the capacity of streams to assimilate these wastes has been exceeded and they can not meet the needs of other water users. Complete use depends on a rational use of waters for waste disposal.

The principal water uses for the entire basin are indicated by symbols on Map No. 4.

POLLUTION CONTRIBUTED TO WATER RESOURCES

The pollution load from municipal sewerage systems as reported by the States is shown in Table A. There are 1175 municipalities (includes incorporated or unincorporated municipalities and other population centers) discharging sanitary sewage wastes to the water courses. The population served by these sewerage systems exceeds 6,544,849. Seven hundred and fifteen of these municipal sewerage systems which serve 3,484,988 persons, discharge wastes, including some industrial wastes, with an estimated population equivalent of 3,257,344 to the watercourse. Four hundred and thirty, with an estimated population served of 3,059,861, discharge wastes of undetermined strength. Another thirty-one municipalities, for which no population served figures are available, discharge wastes to the watercourses of the basin. Data regarding the amount and strength of wastes contributed by industries to municipal sewers is incomplete.

There are one hundred and sixty industrial plants discharging wastes through separate outlets which have a reported population equivalent of 3,535,814. There are also two hundred and seven industrial plants producing organic wastes, sixty-two producing inorganic wastes and six hundred ninety-six producing wastes of undetermined type for which no population equivalent for the waste discharged to the stream, has been reported.

These data indicate that the total reported liquid wastes discharged to the watercourses is equivalent to the untreated wastes of approximately seven million people, with industries contributing more than one half of the wastes. It is also evident from Tables A and B, that the reported amount of pollution discharged to the watercourses is probably not even 50% of the actual amount of pollution discharged. The data used in compiling Table B were the best available, but are incomplete for most sub-basins and completely lacking in others.

The Water Pollution Control Authorities for the States of Georgia and Louisiana have made no report on sources of industrial pollution. The data on industrial sources of pollution included in the tables were obtained from "Manufacturers of Georgia" for the State of Georgia, and "Industrial Directory" for the State of Louisiana. These state publications are prepared by the Georgia Agricultural and Industrial Board supplemented by information from the Georgia State Department of Commerce, and the Louisiana Department of Commerce and Industry.

The industrial organic wastes originate principally from the plants producing food and kindred products, textile products, paper and allied products, lumber and wood products and some of the chemical plants. The inorganic wastes are from chemical plants, primary metal industries, metal fabrication,

the production of petroleum and coal, the manufacture of rubber products, and mining. Concentrated industrial waste discharges are found in the upper portions of the sub-basins along the Atlantic coast through the central part of Georgia and Alabama. This is the most highly industrial section of the area. There are, however, several coastal areas where concentration of industrial wastes are creating problems. Additional field work and state-wide surveys are necessary to make an adequate appraisal of the industrial and domestic waste situation in the Basins.

The number of sources of municipal and industrial pollution by sub-basins is shown on map number one, entitled "Sources of Pollution". In parts 2, 3 and 4, of this report, the detail statistical data concerning sources of pollution in each of the forty-six sub-basins are presented in tables A to A_{46} and B to B_{46}.

The streams rising in the mountains or the upper part of the Piedmont Plateau carry heavy silt loads. This type of pollution has not been considered in detail in this report. Active soil conservation programs of the Department of Agriculture, are reducing the amount of top soil lost and re-establishing woodland, improving land utilization and returning some land to forests. The silt removal from the land is an economic loss to the farmers.

Erosion control can be justified in the protection of farmlands, but it is also important in pollution control as silt damages the streams and restricts some important water uses.

The use of organic insecticides in the agricultural field is another potentially serious source of pollution. Recently insecticides washed into the streams by rainfall and runoff from fields dusted to control cotton insects were responsible for killing large numbers of fish.

There is some oil production in the area, but the pollution which may result from these operations has not been considered in detail as no oil field pollution problems have been reported. The State of Alabama has leased approximately 600,000 acres of state land under Mobile Bay to a company which proposes to explore, prospect, drill or mine for oil, gas, all forms of petroleum products and sulphur. Pollution by oil field wastes may become a problem and the states involved should enact legislation to control discharge of brines and oil wastes.

There is some mining for coal, minerals and phosphates. There are no reported pollution problems resulting from arid mine drainage. The State of Florida, however, is making a stream survey to determine the extent of pollution resulting from phosphate mining operations, and to offer corrective proposals.

TABLE A

SOUTHEAST DRAINAGE BASINS

SOURCES OF POLLUTION

MUNICIPAL

Municipalities*	Sources of Pollution (In Number of Municipalities)	Population Served by Sewerage System	Amount of Pollution Discharged to Watercourse (In Terms of Equivalent number of People)
Having data on pollution load discharged to watercourse	715	3,484,988	3,257,344
Having population data available (Data on pollution load to watercourse incomplete or not available	[a]430	3,059,861	Not applicable
TOTAL	[b]1,175	6,544,849	XXX XXX

*Includes incorporated or unincorporated municipalities, other legal bodies as sanitary districts, counties, towns, significant institutions, resorts, recreational centers, or other population centers; sanitary sewage wastes discharged by industry directly to watercourse and industrial wastes discharged into municipal sewage systems.

a. Includes one municipality also listed as having data on pollution load discharged to watercourse, for a part of its population.

b. Includes thirty-one municipalities for which no population served or pollution discharged to watercourse figures are available. Total adjusted to correct for duplication noted in footnote (a).

TABLE B

SOUTHEAST DRAINAGE BASINS

SOURCES OF POLLUTION

INDUSTRIAL

Industries	Sources of Pollution (In Number of Plants)	Amount of Pollution Discharged to Watercourse (In Terms of Equiv. No. of People)
Producing Organic Wastes	160	3,535,814
Producing Organic Wastes	207	Undetermined
Producing Inorganic Wastes	[a] 62	Not Applicable
Producing Wastes of Undetermined Type	[b] 696	Undetermined
TOTAL	[c] 1,109	xxx xxx

a. Includes sixteen plants also producing organic wastes.

b. Includes industries in Georgia (only those types normally considered to discharge wastes with pollutin characteristics) based on information obtained from "Manufacturers of Georgia" prepared by the Georgia Agricultural and Industrial Board and supplemented by information from the Georgia State Department of Commerce. Population Equivalents and discharge points of pollution in Georgia have not been reported by the State Water Pollution Control Agency.

c. Total adjusted to correct for duplication noted in footnote (a).

DAMAGES TO WATER RESOURCES

No attempt has been made to evaluate in dollars the damages to water resources, since the data available is too incomplete. Even if more adequate data were available, a dollar evaluation of all damages would be difficult if not impossible. Some damages can be accurately estimated, such as additional cost of development and operation of water supplies while others can not.

The principal pollutants in all of the sub-basins are the industrial and municipal wastes. There is heavy silt pollution in all of the rivers flowing thru the Piedmont Plateau. Most of the water courses receive some agricultural pollution made up of drainage from livestock feed lots, dairy barns, pig pens, manure heaps, and other farm refuse. Insecticides, poison sprays and dips may also add to the pollution of the streams.

Pollution damages are greatest in the more highly developed areas, where pollution control has not kept pace with industrial and urban development.

The available data will not permit a detailed account of all the water pollution damage effects in the basins, but it does indicate that comprehensive water pollution control programs are needed to abate existing pollution and prevent additional damage to the water resources.

Many instances are on record where pollution has prevented shellfishing and resulted in direct economic loss, particularly to oyster fishermen. Oysters occur in the river estuaries, bays and sounds along the entire coast of the basin. There is hardly a major river estuary in this entire region which does not have areas where the taking of oysters is prohibited because of pollution. Over six thousand acres of oyster beds have been condemned along the North Carolina coast alone.

In some areas swimming beaches have been condemned because of pollution. In 1945 a survey of the waters of Biloxi Bay in Mississippi indicated that these waters were too highly polluted to be suitable for swimming. A survey in 1942 showed that the bathing beach at Pascagoula, Mississippi, was not safe for bathing. Similarly certain beaches at Pensacola, Florida, and at Winton, North Carolina, on the Chowan River have been injured as evidenced by high coliform concentrations. At other points along the coast of the basin near large centers of population, beaches have been developed only directly on the ocean, rather than on bays, partly because these cities are primarily pollution free.

Industrial pollution has been a factor in reducing recreational and commercial fishing in some instances. Complaints have been received that the paper mills at Franklin, Virginia, and Macon, Georgia, have had adverse affects on the fish in

rivers into which they discharge waste effluents. Pollution discharged directly into Back Bay at Gulfport, Mississippi, is said to have damaged sport fishing, as has clay silt which has escaped into the Peace and Alafia Rivers of Florida, as a result of phosphate mining activities. More recently a complete fish kill in twelve miles of the Coosa River below Gadsden, Alabama, has been reported, presumably resulting from the dumping of industrial waste. Damage to fish life has also resulted from industrial wastes in some of the tidal waters of Nassau County, Florida.

During the summer of 1950, agricultural activities resulted in pollution and extensive loss of fish life in a number of rivers. This loss resulted from the use of several organic insecticides in a cotton growing region and was associated with rainfall which washed the insecticides from the soil into water courses of the region. Considerable apprehension has been felt about the potentialities of this situation as the insecticide might pass into the domestic water supplies in cases where water from surface sources is partially or improperly purified. With the increasing amounts of these chemicals available for use and emphasis being placed on agricultural production, especially of cotton, further difficulty from this source is anticipated.

Rice Creek into which the Hudson Pump and Paper Company discharges wastes at Palatka, Florida, is affected very

profoundly from the point of waste discharge to the mouth of the Creek. A considerable area of the St. Johns River near the mouth of the Creek is also affected to some extent. Pollution of the Neuse River is increasing the cost of development of needed additional water supply for Raleigh, North Carolina.

Salt water intrusion into underground aquifers is of great concern in Florida where most of the water supplies are obtained from ground water. The drainage of fresh water lakes is controlled to prevent salt water intrusion. The pumping of wells is also controlled to prevent excessive drawdown of the fresh water table.

The subsurface discharge of wastes have created problems by the pollution of underground waters, and this practice has been stopped where public water supplies are involved.

BENEFITS RESULTING FROM POLLUTION PREVENTION & ABATEMENT

There are numerous benefits resulting from pollution prevention and abatement programs. Many of these are of a local nature and other benefits are basin wide. Benefit to all water uses will come as a natural result of pollution control.

Polluted waters are always a threat to public health, from the standpoint of downstream water supplies and bathing. A tangible benefit consisting of reduced cost of water treatment is realized by treatment of wastes. There is also the intangible benefit to public health through treatment of sewage by minimizing the possibility of infection from water bourne diseases.

The public health significance of sewage pollution in shellfish waters has been definitely established and tangible benefits result from pollution prevention and abatement in these shellfish areas. Construction of three sewage treatment plants since 1948 in the Norfolk-Hampton Roads, Virginia region has opened two-thirds of the waters for taking of oysters that previously had been closed by State order. Additional treatment of sewage at Biloxi, Mississippi permitted opening of extensive oyster beds in the Back Bay that had been closed because of polluted waters.

The economic loss resulting from soil erosion pollution is tangible, but so great that no definite cost has been

established for the loss of this unreplacable natural resource. Silt in the streams hinders fish propagation and reduces the use of the waters for recreational purposes. The silt deposits at the mouth of the streams, resulting in expensive dredging operations to keep the harbors and channels open for navigation. Pollution in waterways and harbors reduces effectiveness of hull paint on ships and causes serious corrosion of harbor facilities. Considerable tangible benefit is derived by abatement of pollution in waterways and harbors.

The poor quality of waters in some bays and water courses has impaired its use for recreational purposes and deprived many residents and tourists of needed recreational areas. Restoration of clean waters by pollution control will result in recreational use and an increased economy to the area.

Ground water supplies are limited in the Piedmont Plateau and municipalities and industries in need of supplementing their supplies must rely on surface waters. Raleigh, North Carolina requires additional water but due to pollution on the upper Neuse River, the State Board of Health can not permit use of this stream that flows near the city. Municipalities benefit through pollution abatement and control by being permitted to develope nearby water sources, thus avoiding the excessive cost of obtaining water from great distances.

In some instances industries have benefited by greater utilization of their raw materials and recovery of wastes that

can be used as by-products. By careful waste control industries have benefited through increased production and resultant revenue. The Alabama Water Improvement Advisory Commission requested a recently constructed newsprint plant on the Coosa River to install waste spillage saving devices. This practice has reduced pollution of this stream and benefited the industry by a saving in raw materials and a lower capital investment required for waste treatment facilities

Meat packing, milk products and food processing plants can materially reduce the cost of municipal treatment where wastes go to city sewers and can reduce the degree of treatment necessary where wastes are discharged directly to streams, by practicing good housekeeping and use of recovery measures.

Local downstream nuisances created by inadequate or no treatment of municiple sewage can be eliminated by adequate waste treatment. This action will result in a tangible increase in downstream riparian property values.

General benefits to the public and private interests are both tangible and intangible. They include preservation of one of the most valued natural resources so necessary to a growing population and expanding industrial economy.

POLLUTION PREVENTION MEASURES IN EFFECT

The tabular summary Table C shows that 536 of the 1,175 sewered communities have 630 primary treatment plants with a combined population served of 2,122,818. Two hundred and forty-eight municipalities, five of which also provide primary treatment for part of their sewage, have secondary treatment plants serving a population of 1,219,285. Four hundred and thirteen municipalities discharge domestic sewage without treatment. The population served by these sewerage systems is 3,202,746. However, fifteen of these municipalities provide primary treatment and two others provide secondary treatment for part of their wastes. Included in these figures are 31 population centers for which no population figures are available. Fifty-one percent of the domestic sewage receives treatment (32 percent primary and 19 percent secondary) before discharge to the watercourse. There are two sub-basins in which all of the sewage from the 33,960 people served receives some treatment.

The reported existing industrial waste treatment facilities are classified by type of industry in Table D. Fifty-nine of the 1,109 industrial plants provide some treatment for their wastes. Two hundred

and sixty-six of the industries are reported as having no waste treatment facilities. The status of waste treatment for the other 784 is undetermined. Some of these industrial plants may discharge their wastes to municipal sewerage systems.

The existing municipal and industrial waste treatment works are shown on Map No. 2. The adequacy of these treatment works with relation to their capacity and operation are summarized in Table E.

Three hundred and fifty of the 901 municipal waste treatment plants are adequately designed with relation to capacity and degree of treatment. Three hundred and fifty-five treatment plants are reported as inadequate either in capacity or degree of treatment and adequacy of the remaining 196 is undetermined. Five hundred and thirty of the plants are satisfactorily operated, while the operation of 149 is reported as unsatisfactory and undetermined for the remaining 222 municipal waste treatment plants.

The capacity and degree of treatment is satisfactory for 23 of the 59 industrial waste treatment facilities, unsatisfactory for 13, and undetermined for the remaining 23. The operation of these plants is satisfactory for 29, unsatisfactory for five and undetermined for 25.

All of the State Agencies review the plans and specifications for all proposed waste treatment facilities in their respective states.

Approval of the plans as based on the degree of treatment required to prevent pollution. Some of the States are developing state-wide pollution control programs based on stream and waste studies. It is desirable that all states develop similar programs so that state boundaries will have little or no effect on the development of interstate water pollution control programs.

Water pollution control legislation in the states in the basins varies from recently enacted comprehensive legislation to scattered statutory provisions dividing the authority between state agencies.

Three states have legislation establishing water pollution control authorities and are developing satisfactory programs. One has statutory authority to establish rules and regulations and has an active water pollution control program.

One state has an active water pollution control program but present legislation is not considered adequate. A special committee has been conducting stream surveys for nearly two years and their legislation is being prepared.

Comprehensive water pollution control legislation is needed in the other states. Uniformity of policy, procedure, and planning is essential to the development of comprehensive water pollution control programs.

TABLE C

SOUTHEAST DRAINAGE BASINS

EXISTING TREATMENT FACILITIES

MUNICIPAL

Degree of Treatment Provided	Number Municipalities*	Plants	Population Served
Primary	536	630	2,122,818
Secondary	[a] 248	271	1,219,285
No Treatment	[b] 413	XXX	3,202,746

* Includes incorporated or unincorporated municipalities, other legal bodies as sanitary districts, counties, towns, significant institutions, resorts, recreational centers, or other population centers; sanitary sewage wastes discharged by industry directly to watercourse and industrial wastes discharged into municipal sewage systems.

a. Includes five municipalities also listed under primary treatment.

b. Includes fifteen municipalities also listed under primary treatment and two municipalities also listed under secondary treatment.

TABLE D

SOUTHEAST DRAINAGE BASINS

EXISTING TREATMENT FACILITIES

INDUSTRIAL *

Type Industry	Number of Plants	Number of Industrial Plants Having: Treatment Facilities	No Treatment Facilities	Undetermined Facilities
Food & Kindred Products	434	18	96	320
Textile Mill Products	178	25	83	70
Lumber and Wood Products	6	0	1	5
Paper and Allied Products	43	5	23	15
Chemical and Allied Products	[a]363	[b] 4	[c]35	324
Product of Petroleum & Coal	16	0	6	10
Rubber Products	1	0	0	1
Leather and Leather Products	7	1	1	5
Primary Metal Industries	3	0	3	0
Fabricated Metal Products	9	1	2	6
Miscellaneous	43	6	16	21
Mining	10	0	0	10

* Industries having separate outlets and discharging wastes directly to watercourse.

a. Includes 2 plants also listed in Textile Mill products and 2 plants also listed in Paper and Allied products.
b. Includes one treatment plant which serves two types of industry and is also listed under Paper and Allied products.
c. Includes 2 plants also listed under Textile Mill products and one plant also listed under Paper and Allied products.

TABLE E

SOUTHEAST DRAINAGE BASINS

ADEQUACY OF EXISTING TREATMENT FACILITIES*

Existing Treatment Facilities	Number	Adequacy with Relation to: Capacity			Operation		
		Satisf.	Unsatisf.	Undetermined	Satisf.	Unsatisf.	Undetermined
Municipal	901	350	355	196	530	149	222
Industrial	59	23	13	23	29	5	25

* No report made by the Georgia Water Pollution Control Agency, therefore all Georgia plants are shown under undetermined.

POLLUTION PREVENTION MEASURES REQUIRED

Table G summarizes the municipal and industrial waste treatment requirements in the basin as reported by the State Water Pollution Control Agencies. Table H indicates the status of the projects to meet these requirements.

There are 658 pollution abatement projects required to serve a combined population of 3,976,335. These projects include 483 new plants, 147 additions or enlargements to existing plants, and replacement of 28 existing plants. No projects are required at 381 municipal sources of pollution having a total population of 1,447,519. Disregarding the 261 municipal sources of pollution for which the project requirements are undetermined, the known project requirements indicate that only forty percent of the sewered municipalities having twenty-seven percent of the sewered population have adequate treatment of their sewage. Considering these 261 sources only twenty-nine percent of the sewered municipalities having twenty-two percent of the sewered population have adequate waste treatment facilities.

Of the 183 industrial establishments with direct waste discharge to water courses for which treatment requirements have been determined 135 are in need of

new plants, 9 require addition or enlargement to existing plants and 39 require no project. The 144 industries reported by the State Agencies as requiring some project, constitute seventy-nine percent of those for which project requirements have been determined. Project requirements for 926 industries have not been reported. These figures indicate the program for abatement of industrial pollution is only in its early stages.

The available information in regards to status of required projects for pollution abatement is summarized in Table H. Definite action has been taken at 150 municipalities to provide sewage treatment facilities. Of these, abatement has been ordered at 11, plans are under preparation at 78, plans are approved for 26, 25 plants are under construction, and construction is awaiting financing at 10. No formal action has been taken at 455 municipalities and the status at 314 others is undetermined. Two industrial waste treatment plants are under construction and plans are under preparation at a third. No formal action has been taken with 232 industries and the action status at 835 is undetermined.

Table F shows the progress in pollution abatement for the period 1946 through 1949. There were

97 municipal treatment projects and eight industrial waste treatment plants constructed during this period. The number of municipal plants constructed per year has shown considerable increase, but at the 1949 rate of 53, over twelve years would be required to complete the program for existing pollution abatement as reported desirable by the State Water Pollution Control Agencies. The rate of progress for reduction of industrial pollution is low; based on 1949 industrial treatment construction forty-eight years would be required to complete the programs. Neither of these predictions considers possible requirements at the 261 municipalities and 926 industries where need of treatment facilities remains undetermined.

Projects required by sub-basins are shown on Map No. 3. The projects required in each sub-basin include new treatment plants, additions, enlargements and replacement of existing treatment facilities. Project requirements for abatement of pollution having its source in Georgia have been indicated as undetermined since the Georgia Water Pollution Control Agency did not submit this information for inclusion in this report. Detail data on sources of pollution in each sub-basin are presented in Tables G_1 and H_1 thru G_{46} and H_{46} of Parts 2, 3, and 4 of this report.

On the basis of available data indicated in Table G, the approximate capital cost of municipal treatment projects for pollution abatement in the basin is estimated at $108,000,000. This does not include requirements for municipal waste plants listed as undetermined or industrial waste treatment works. Considering these other needed facilities, the approximate capital cost is estimated at $500,000,000.

TABLE F

SOUTHEAST DRAINAGE BASINS

PROGRESS IN POLLUTION ABATEMENT

	Municipal		Industrial	
Year	Plants Completed	Design Population	Plants Completed	Amount of Wastes Treated (In Terms of Equiv. No. People)
1946	3	2,425	0	-
1947	20	251,750	2	3,600
1948	21	260,030	[a]3	21,000
1949	53	[b]371,875	3	5,000

a. Includes one plant for which waste treated (in terms of equivalent number of people) figures are not available.

b. Includes enlargement of one treatment plant to a design population of 8,000.

TABLE G

SOUTHEAST DRAINAGE BASINS

REQUIREMENTS FOR MUNICIPAL AND INDUSTRIAL

WASTE TREATMENT PLANTS

Requirements	Municipal		Industrial
	Number*	Population Served by Facilities	Number
New Plant	483[ab]	2,903,143	135
Enlargement or Additions to Existing Plant	147[c]	878,532	9
Replace Existing Plant	28	194,660	0
No Project Required	381[d]	1,447,519	39
Undetermined	261[e]	1,128,455	926

* Number column includes one hundred twenty-five more project requirements than the total number of municipal sources of pollution. These additional projects are required for municipalities with multiple outfalls.

a. Includes eight municipalities for which no population served figures are available.

b. Includes seven municipalities having a population of 7,460 requiring complete sewerage systems not reported as sources of pollution in Table A.

c. Includes one municipality for which no population served figure is available.

d. Includes nine municipalities for which no population served figures are available.

e. Includes nine municipalities for which no population served figures are available.

The Georgia Water Pollution Control Agency has not reported requirements therefore all Georgia plants are shown under undetermined.

TABLE H

SOUTHEAST DRAINAGE BASINS

STATUS OF TREATMENT WORKS PROJECT
TO ABATE POLLUTION

July 1, 1950

Status of Project	Number	
	Municipal	Industrial
No Formal Action	455	232
Abatement Ordered	11	0
Plans under Preparation	78	1
Final Plans Approved	26	0
Construction Awaiting Financing	10	0
Under Construction	25	2
Status Undetermined *	314	835

* The Georgia Water Pollution Control Agency has made no report regarding status of treatment works therefore all Georgia plants are listed as status undetermined.

Map No. 1

SOURCES OF POLLUTION

Map No. 2

EXISTING TREATMENT WORKS

Map No. 3

PROJECT REQUIREMENTS

Map No. 4

EXISTING PRIMARY WATER USES